Title: Value Your Digits

Link to Outcomes:

- **Problem Solving** Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, and problems which are solved in a cooperative atmosphere.

- **Communication** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Connections** Students will demonstrate their ability to connect mathematics topics within the discipline, with other disciplines, and real-life situations.

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- **Number Sense & Numeration** Students will demonstrate their ability to recognize numeric relationships and will generalize a relationship from data.

- **Concepts of Whole Number Operations** Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe the effects operations have on numbers.

- **Patterns and Relationships** Students will demonstrate numeric relationships by ordering their collected data.

Brief Overview:

This interdisciplinary place-value mathematics/ language arts/ economics unit will offer a variety of hands-on experiences. Students will solve problems involving a numeral's value based on the digit positions, compare and order numerals, and generate data to be utilized.

Grade/Level:

Grade 3

Duration/Length:

This lesson may be conducted during 4 mathematics class periods. However, extension activities may encompass more time.

Prerequisite Knowledge:

- numerical grouping by tens using the ten digits 0 through 9.
- how digit order determines value (one, tens, hundreds, thousands, etc.).

Objectives:

Students will be able to:

- construct two digit numbers through 99.
- read and write two and three digit numbers to identify the places in a number.
- compare and order two digit numbers.
- regroup for ones, tens, and hundreds.
- demonstrate an understanding of the value of coins.
- compare amounts of money.
- count amounts of money.

Materials/Resources/Printed Materials:

- Digit Cards (0-9)
- Worksheet 1: "Double Digits"
- Index Cards
- Mathematics Journals
- Overhead Base Ten Blocks
- Overhead "Banker and Trader" Place Value Board
- Base Ten Blocks
- "Banker and Trader" Place Value Boards
- Number Cubes
- *Dollars and Cents for Harriet* by Betsy and Giolio Maestro, Crown Publishers 1988
- Manipulative Money (pennies, dimes, one dollar bills)
- Overhead Worksheet 2: "Pinching Pennies"
- Worksheet 2: "Pinching Pennies"
- Coin Cubes
- Overhead Worksheet 3: "Sundae Math"
- Worksheet 3: "Sundae Math"
- Crayons
- Pencils

Development/Procedures:

Students will be arranged in cooperative learning groups for some of the activities.

Day 1: *"Double Digits"*

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- Select two of the ten digit cards. Students will determine a numeral that can be made using the two digits. The educator will record student responses on the chalkboard. Ask for additional responses and record. Discuss that only two possible numbers can be made due to the number of digits. Ask the students to compare the value of the numbers by explaining which one is larger.

  Demonstrate the following digit card game:

  1. Select one digit card. Students will attempt to make the largest number by recording the numeral in the tens or ones place on Worksheet 1. Once the digit is written, it may not be moved.
  2. Select a second card and have them fill in the other digit. Ask students to state the numerals they wrote and identify the largest. The winners are those who placed the largest digit in the tens place.
  3. Repeat as many times as necessary to assure student understanding.

- Students will work in cooperative learning groups to repeat the Digit Card Game. Students will record their responses on Worksheet 1.

- Each student will select one number from Worksheet 1 and write it on an index card. Select several students to display the numerals. Ask the class to read and arrange the numerals in numerical order. Repeat if needed.

Day 2: *"Banker and Trader"*

- Give the students free exploration time for manipulating base ten blocks.

- The educator demonstrates the following procedures for the "Banker and Trader Game:"
  1. The educator will invite two student volunteers to play the game.
  2. One student, the trader, will roll a number cube and place the corresponding number of ones units on the overhead place value board. The trader continues rolling until there are at least ten ones units on the board.
  3. Then the trader requests that the other student, the banker, trades 10 ones-units for one 10s- unit. The trader places the tens unit on the tens side of the board. Students repeat rolling the cube and placing base ten blocks on the board.
  4. Continue trading as necessary to assure understanding.

- Working in cooperative learning groups, the students will play the "Banker and Trader Game." After a designated time period, the students will switch roles of banker and trader.

Day 3: *"Pinching Pennies"*

- Educator will read *Dollars and Cents for Harriet.* After reading, students will identify what combinations of money were used to illustrate the value of a dollar. Ask students to identify what money could be used to represent ones, tens, and hundreds.

- Students will have free exploration time with the money.

- The educator will demonstrate the "Pinching Pennies Game:"

  1. Using the Overhead Worksheet 2, the teacher invites students to take turns rolling the coin cube. Once the cube is rolled, the student will place the specified amount of money on Worksheet 2.
  2. Students continue to roll the cube, adding money until it is necessary to make a trade into the dimes column.
  3. Students continue to roll until the class breaks the one dollar level.

- Students work in cooperative learning groups playing the "Pinching Pennies Game." The students take turns rolling the money cube and recording responses on Worksheet 2 by placing the money in the appropriate columns making the exchanges where necessary. The students continue until both students have at least one dollar.

Day 4: *"Sundae Math"*

- Introduce the concept of an ice cream parlor. The educator will establish the following roles: store owner who collects the money, banker who trades pennies for dimes, and the buyer.

- Students generate a list of toppings with prices. Students complete Worksheet 3: "Sundae Math" indicating choices of toppings and prices.

- Students are given 10 dimes. Students go through an imaginary sundae line building their own sundaes. When the student selects an item, the student must pay the store owner the specified amount at that time. For example, if chocolate sauce costs 6 pennies, the student goes to the banker to trade a dime for 10 pennies. After completing the sundae, the student records the total number of toppings and change.

Evaluation:

Day 1:

Circulate around the classroom as the students work in cooperative learning groups to evaluate student understanding of process and results. The students will explain the comparison of numerals by using place value in the mathematics journals.

Day 2:

Circulate around the classroom as the students work in cooperative learning groups to evaluate student understanding of process and results. Ask students to respond in the mathematics journal about real-life applications of bankers and borrowers.

Day 3:

Circulate around the classroom as the students work in cooperative learning groups to evaluate student understanding of process and results.

Day 4:

Circulate around the classroom as the students work in cooperative learning groups to evaluate student understanding of process and results. Students complete Worksheet 3.

Extension/Follow Up:

Day 1 Extension:

- When students display numbers on the index cards, provide blank index cards for students to supply the "missing numbers" in the number line.

Day 2 Extension:

- Students may continue the place value activity past the hundreds unit.

Day 3 Extension:

- The educator may select a variety of economic lessons. For instance, students may establish a class store or a "Mini-Society."

Extensions may also include sharing the following literature:

How Much is that Guinea Pig in the Window, Joane Rocklin, Scholastic, 1995.

*If You Made a Millio*n, David M. Schwartz, Lothrop, Lee & Shepard, 1989.

How Much is a Million, David M. Schwartz, Lothrop, Lee & Shepard, 1985.

Zero is Not Nothing, Mindel and Harry Sitomer, Thomas Y. Crowell, 1978.

Alexander, Who Used to Be Rich Last Sunday, Judith Viorst, Macmillan, 1978.

References:

Harcourt Brace and Company Mathematics Book -Grade 3, 1994.
Addison-Wesley Mathematics Book -Grade 3, 1993.

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Worksheet 1: “Double Digits”

Player 1	Name:		Player 2	Name:	Winner
Tens	Ones		Tens	Ones	

“Banker and Trader Place Value Board”

Tens	Ones

Worksheet 2: "Pinching Pennies"

Dollar	Dime	Penny

Worksheet 3: “Sundae Math”

Topping	**Cost**
Total Number of Toppings=	**Remaining Money=**